
Appendix B

Protection Requirements

**CINERGY BULLARD ENERGY CENTER PROJECT
FACILITY STUDY**

PRELIMINARY PROTECTION REQUIREMENTS

EDRO: JUNE 2008

The following Preliminary Protection Requirements are for estimating purposes only of the Cinergy Bullard Energy Center Interconnection Project. The actual relays specified in the final protection requirements may differ from those outlined in this document.

Per Section G2.1 of the PG&E Interconnection Handbook, PG&E protection requirements are designed and intended to protect PG&E's system only. Generation Entity is responsible for the protection of its own system and equipment and must meet the requirements in the PG&E Interconnection Handbook.

ASSUMPTIONS:

- 1) The Cinergy Bullard EC Facility will consist of two gas turbine generators rated at 102.6 MW (maximum net output will be 205.2 MW) with a plant auxiliary load of 5.2 MW.
- 2) This generation will be looped onto the Herndon - Kearney 230kV Line. The Herndon – Bullard 230kV line will be 1.6 miles. The Bullard – Kearney 230kV Line will be 9.2 miles.
- 3) A Ring (Future BAAH) configuration will be utilized at the Cinergy Bullard Switching Station in order to improve availability and reliability of Facility.
- 4) Due to the Cinergy Bullard EC Facility Generation Interconnection Project the following network upgrades are required:
 - a. Reconductor the existing Herndon Bullard EC 230kV Line with 1113 ACSS conductor.
- 5) Regarding requirements for a second set of line protection CTs, refer to the "Recommended Design Information for CT and PT". If it is determined that a second set of CTs is required, then for line protection, Set A relay will be on one set, Set B relay and breaker failure relay will be on another set.
- 6) These protection requirements will not cover special protection set-ups for temporary transmission line shoo-fly configurations that may be necessary to complete this project.
- 7) Line relays specified are per existing System Protection list of relays approved for purchase. Existing Engineering Design Standards are associated with application of these relays.
- 8) Relay coordination was not reviewed for this study. Recoordination studies could result in the required replacement of relays that are determined to be out of range as a result of this interconnection.

- 9) Study is based upon existing information available, any changes to the interconnection queue, connection point, or project information will result in a restudy of the area.

PROTECTION REQUIREMENTS

The Protection Requirements will consist of replacing the existing line protection and carrier equipment at Kearney and Herndon. The Herndon – Bullard 230kV Line will have a fully redundant, double-pilot current differential scheme utilizing dual fiber optic communications. The Bullard– Kearney 230kV Line will utilize a two terminal carrier scheme. The Bullard – Bullard EC 230kV Line will have a fully redundant, double-pilot current differential scheme utilizing dual fiber optic communications. The details are as follows:

COMMUNICATIONS

Fiber Optic Links:

- Install dual redundant fiber optic cables between Herndon substation and Bullard substation.
- Install dual redundant fiber optic cables between Bullard substation and Bullard EC Facility.

HERNDON SUBSTATION

CB 232: Herndon – Bullard EC 230kV Line

- Line Length: **Approx 1.6 miles**
- Remove existing line protection.
- Install G.E. L90 SET A current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.
- Install SEL 311 L SET B current differential relay as one terminal of a two-terminal Herndon – Bullard EC pilot scheme using dual fiber optic communication line.

KEARNEY SUBSTATION

CB 212: Bullard EC - Kearney 230kV Line

- Line Length: **Approx 9.2 miles**
- Remove existing line protection.
- Install G.E. D60 SET A relay as one terminal of a two-terminal carrier scheme on power line carrier.

- Install SEL 311 C SET B relay as one terminal of a two-terminal carrier scheme on power line carrier.
- Evaluate existing Wave Trap.
- Install Pulsar TCF-10B power line carrier transceiver for frequency shift keying scheme.
- Reference and apply Borden drawing # 4040518, 4040519, 4040520 and 4040521 where appropriate.

BULLARD SWITCHING STATION

- CB AAA/CCC: Herndon – Bullard 230kV Line
- Line Length: **Approx 1.6 miles**
- CB AAA: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.
- CB CCC: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.
- All CTs to be pulled into the control room.
- Install G.E. L90 SET A current differential relay as one terminal of a two-terminal Herndon – Bullard pilot scheme using dual fiber optic communication line.

Wire to outermost Bus-side CT of CB AAA and CB CCC.

- Install SEL 311 L SET B current differential relay as one terminal of a two-terminal Herndon – Bullard pilot scheme using dual fiber optic communication line.

Wire to innermost Bus-side CT of CB AAA and CB CCC.

- Install three (3) line-side CCVTs to provide polarizing potentials for line protection and station automatics.
- Install one (1) bus-side CCVTs to provide synchronizing potential for station automatics.

CB BBB/CCC: Bullard - Kearney 230kV Line

- Line Length: **Approx 9.2 miles**
- CB BBB: Install one-230kV SF6 circuit breakers with bushing CTs rated 2000/5 per PG&E specifications.
- All CTs to be pulled into the control room.
- Install G.E. D60 SET A relay as one terminal of a two-terminal carrier scheme on power line carrier.

Wire to outermost Bus-side CT of CB BBB and CB CCC.

- Install SEL 311 C SET B relay as one terminal of a two-terminal carrier scheme on power line carrier.

Wire to innermost Bus-side CT of CB BBB and CB CCC.

- Install Wave Trap with 200–400kHz tuning range.
- Install Pulsar TCF-10B power line carrier transceiver for frequency shift keying scheme.
- Install three (3) line-side CCVTs to provide polarizing potentials for line protection and station automatics.
- Install one (1) bus-side CCVTs to provide synchronizing potential for station automatics.

CB AAA/BBB: Bullard – Bullard EC Facility 230kV Line

- Line Length: **Approx 100 feet**
- Install G.E. L90 SET A current differential relay as one terminal of a two-terminal Bullard – Bullard EC Facility pilot scheme using dual fiber optic communication line.

Wire to outermost Bus-side CT of CB AAA and CB BBB.

- Install SEL 311 L SET B current differential relay as one terminal of a two-terminal Bullard – Bullard EC Facility pilot scheme using dual fiber optic communication line.

Wire to innermost Bus-side CT of CB AAA and CB BBB.

- Install three (3) line-side CCVTs to provide polarizing potentials for line protection and station automatics.
- Install one (1) bus-side CCVTs to provide synchronizing potential for station automatics.